

*A, Cancelled*  
a first birefringent element having an equivalent angular orientation of  $45^\circ$  and having a phase delay of  $\Gamma$ ; and

a second birefringent element having an equivalent angular orientation of  $-21^\circ$  and having a phase delay of  $2\Gamma$ .

48. (new) The interleaver as recited in claim 37, wherein the birefringent element assembly and the reflector are configured so as to facilitate interleaving of a plurality of input light beams simultaneously.

49. (new) The interleaver as recited in claim 37, wherein the interleaved channels have spacing which is tunable.

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#### REMARKS

This is a response to the Office Action mailed September 12, 2002. Original claims 1-23 have been canceled from the application and new claims 37-49 have been added.

In the Office action, the Examiner rejected Claims 8, 9, 11, 16 and 17 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to point out and distinctly claim the subject matter which applicant regards as the invention. Although claims 8, 9, 11, 16 and 17 have been canceled from this application, Applicant addresses this rejection because some of the new claims 24-49 use language which is substantially similar to that of the canceled claims.

In the rejection of Claims 8, 9, 11, 16 and 17, under 35 U.S.C. 112, the Examiner stated that the meaning of the recitations "equivalent angular orientation" and "equivalent angle of the birefringent element assembly" cannot be ascertained.

However, Applicant respectfully submits that the meaning of these terms is provided within the specification of the patent application as originally filed at paragraphs 44-48. Because the meaning of these terms can be ascertained by reference to

the specification, Applicant respectfully submits that the new claims not be subject to such a rejection under 35 U.S.C. 112.

Further, the Examiner rejected claims 1-7, 10 and 12-23 under 35 U.S.C. 102(e) as being anticipated by Tai et al.

However, Applicant respectfully submits that the Tai reference neither discloses nor makes obvious configurations of spatial birefringent elements recited in claims 13 and 14 of the subject patent application. Moreover, the Tai reference teaches the construction of an interleaver that does not appear to utilize a spatial birefringence assembly. Rather, birefringence is obtained in the Tai device via the use of conventional birefringent crystals.

Indeed, neither of the cited references appear to utilize a spatial birefringent effect. Both of the cited references appear to require the use of conventional birefringent crystals, rather than the use of spatial birefringence, as recited in the claimed invention.

More particularly, none of the cited references, taken either alone or in combination with one another, either disclose or make obvious “wherein each spatial birefringent element defines two light paths, each light path having a different optical path length and wherein a difference in optical path length between the two paths is provided by a material having an index of refraction greater than one which is disposed within at least a portion of one of the first and second paths,” as recited in new claim 24 (and substantially recited in rejected and canceled claim 13 or “wherein each spatial birefringent element defines two light paths and wherein an index of refraction is different for at least a portion of at least one of the two light paths so as to cause the two light paths to have different optical path lengths,” as recited in new claim 37 (and substantially recited in rejected and canceled claim 14.

The subject matter of dependent claim 13 has been incorporated into independent claim 1 and re-written as new independent claim 24. Similarly, the subject matter of dependent claim 14 has been incorporated into independent claim 1 and re-written as new independent claim 37. It is respectfully submitted that independent claims 24 and 37, as well as dependent claims 25-36 and 38-49 which depend therefrom, respectively, are allowable.

Furthermore, it is respectfully submitted that the dependent claims are independently patentable with respect for the independent claims. For example, dependent claims 36 and 49 both recited "wherein the interleaved channels have spacing which is tunable." None of the cited references, taken either alone or in combination with one another, either disclose or make obvious such construction.

In view of the foregoing, it is respectfully submitted that all of the pending claims are in condition for immediate allowance. Reconsideration and an early allowance are therefore respectfully requested.

Attached hereto is a mark-up version of the changes made to the by the current amendment. The attached page is captioned **"Version With Markings to Show Changes Made."**

Please note that applicant's representative has a new address. Please address all correspondence to **Myers, Dawes & Andras LLP, Attention: Norman Carte, 19900 MacArthur Blvd., Ste. 1150, Irvine, CA 92612.**

Respectfully submitted,  
Myers, Dawes & Andras LLP

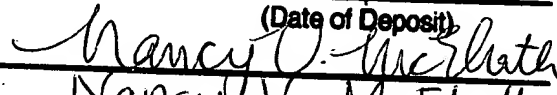
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D.C. 20231, on Feb. 12, 2003

(Date of Deposit)

  
Nancy V. McElrath

Date of Signature 2-12-03

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**In the Claims:**

Claims 1-23 have been canceled.

New claims 24-49 have been added as follows:

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24. (new) An interleaver comprising:
- a birefringent element assembly comprising at least one spatial birefringent element, the birefringent element assembly providing two output components;
  - a reflector configured to direct the two components from the birefringent element assembly back through the birefringent element assembly; and
  - wherein each spatial birefringent element defines two light paths, each light path having a different optical path length and wherein a difference in optical path length between the two paths is provided by a material having an index of refraction greater than one which is disposed within at least a portion of one of the first and second paths.
25. (new) The interleaver as recited in claim 25, further comprising a polarization rotator configured to make the two components approximately the same in polarization with respect to one another prior to the two components being transmitted back through the birefringent element assembly.
26. (new) The interleaver as recited in claim 25, wherein the reflector comprises a prism.
27. (new) The interleaver as recited in claim 25, wherein the reflector comprises a mirror.
28. (new) The interleaver as recited in claim 25, wherein the polarization rotator comprises a half-wave waveplate.
29. (new) The interleaver as recited in claim 25, wherein the reflector comprises a mirror and a quarter-wave waveplate.

30. (new) The interleaver as recited in claim 25, wherein the birefringent element assembly comprises a plurality of spatial birefringent elements.

31. (new) The interleaver as recited in claim 25, wherein the birefringent element assembly comprises a first birefringent element having an equivalent angular orientation of  $\varphi_1$ , a second birefringent element having an equivalent angular orientation of  $\varphi_2$  and a third birefringent element having an equivalent angular orientation of  $\varphi_3$ ;

wherein an order of the first birefringent element, second birefringent element, and third birefringent element is selected from the group consisting of:

first birefringent element, second birefringent element, third birefringent element;

third birefringent element, second birefringent element, first birefringent element; and

wherein the equivalent angular orientations are with respect to an equivalent polarization direction of light entering the birefringent element assembly.

32. (new) The interleaver as recited in claim 25, wherein the birefringent element assembly comprises:

a first birefringent element having an equivalent angular orientation of  $45^\circ$  and having a phase delay of  $\Gamma$ ;

a second birefringent element having an equivalent angular orientation of  $-21^\circ$  and having a phase delay of  $2\Gamma$ ; and

a third birefringent element having an equivalent angular orientation of  $7^\circ$  and having a phase delay of  $2\Gamma$ .

33. (new) The interleaver as recited in claim 25, wherein the birefringent element assembly comprises two birefringent elements.

34. (new) The interleaver as recited in claim 25, wherein the birefringent element assembly comprises:

a first birefringent element having an equivalent angular orientation of  $45^\circ$  and having a phase delay of  $\Gamma$ ; and

a second birefringent element having an equivalent angular orientation of  $-21^\circ$  and having a phase delay of  $2\Gamma$ .

35. (new) The interleaver as recited in claim 25, wherein the birefringent element assembly and the reflector are configured so as to facilitate interleaving of a plurality of input light beams simultaneously.

36. (new) The interleaver as recited in claim 25, wherein the interleaved channels have spacing which is tunable.

37. (new) An interleaver comprising:

a birefringent element assembly comprising at least one spatial birefringent element, the birefringent element assembly providing two output components;

a reflector configured to direct the two components from the birefringent element assembly back through the birefringent element assembly; and

wherein each spatial birefringent element defines two light paths and wherein an index of refraction is different for at least a portion of at least one of the two light paths so as to cause the two light paths to have different optical path lengths.

38. (new) The interleaver as recited in claim 37, further comprising a polarization rotator configured to make the two components approximately the same in polarization with respect to one another prior to the two components being transmitted back through the birefringent element assembly.

39. (new) The interleaver as recited in claim 37, wherein the reflector comprises a prism.

40. (new) The interleaver as recited in claim 37, wherein the reflector comprises a mirror.

41. (new) The interleaver as recited in claim 37, wherein the polarization rotator comprises a half-wave waveplate.

42. (new) The interleaver as recited in claim 37, wherein the reflector comprises a mirror and a quarter-wave waveplate.

43. (new) The interleaver as recited in claim 37, wherein the birefringent element assembly comprises a plurality of spatial birefringent elements.

44. (new) The interleaver as recited in claim 37, wherein the birefringent element assembly comprises a first birefringent element having an equivalent angular orientation of  $\phi_1$ , a second birefringent element having an equivalent angular orientation of  $\phi_2$  and a third birefringent element having an equivalent angular orientation of  $\phi_3$ ;

wherein an order of the first birefringent element, second birefringent element, and third birefringent element is selected from the group consisting of:

first birefringent element, second birefringent element, third birefringent element;

third birefringent element, second birefringent element, first birefringent element; and

wherein the equivalent angular orientations are with respect to an equivalent polarization direction of light entering the birefringent element assembly.

45. (new) The interleaver as recited in claim 37, wherein the birefringent element assembly comprises:

a first birefringent element having an equivalent angular orientation of  $45^\circ$  and having a phase delay of  $\Gamma$ :

a second birefringent element having an equivalent angular orientation of  $-21^\circ$  and having a phase delay of  $2\Gamma$ ; and

a third birefringent element having an equivalent angular orientation of  $7^\circ$  and having a phase delay of  $2\Gamma$ .

46. (new) The interleaver as recited in claim 37, wherein the birefringent element assembly comprises two birefringent elements.

47. (new) The interleaver as recited in claim 37, wherein the birefringent element assembly comprises:

a first birefringent element having an equivalent angular orientation of  $45^\circ$  and having a phase delay of  $\Gamma$ ; and

a second birefringent element having an equivalent angular orientation of  $-21^\circ$  and having a phase delay of  $2\Gamma$ .

48. (new) The interleaver as recited in claim 37, wherein the birefringent element assembly and the reflector are configured so as to facilitate interleaving of a plurality of input light beams simultaneously.

49. (new) The interleaver as recited in claim 37, wherein the interleaved channels have spacing which is tunable.

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